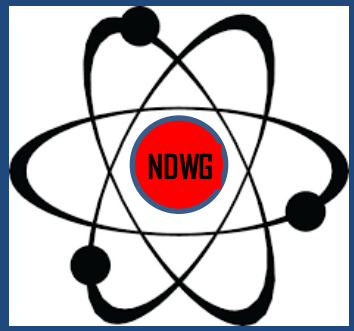
Update on the Nuclear Data Working Group (NDWG)



Lee Bernstein

Nuclear Science Division - Lawrence Berkeley National Laboratory
Department of Nuclear Engineering – UC Berkeley

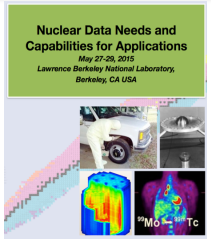
Dave Brown

National Nuclear Data Center – Brookhaven National Laboratory

NDWG Timeline

NDNCA Workshop (5/2015)

NDNCA Whitepaper release (10/2015)



Nuclear Data Exchange Meeting Presentations to Program Managers (4/2016)

NDNCBS Notre Dame (8/2016)

Interagency Nuclear Data Working Group (PMs) (6/2016)

Now

USNDP Review (7/2014)

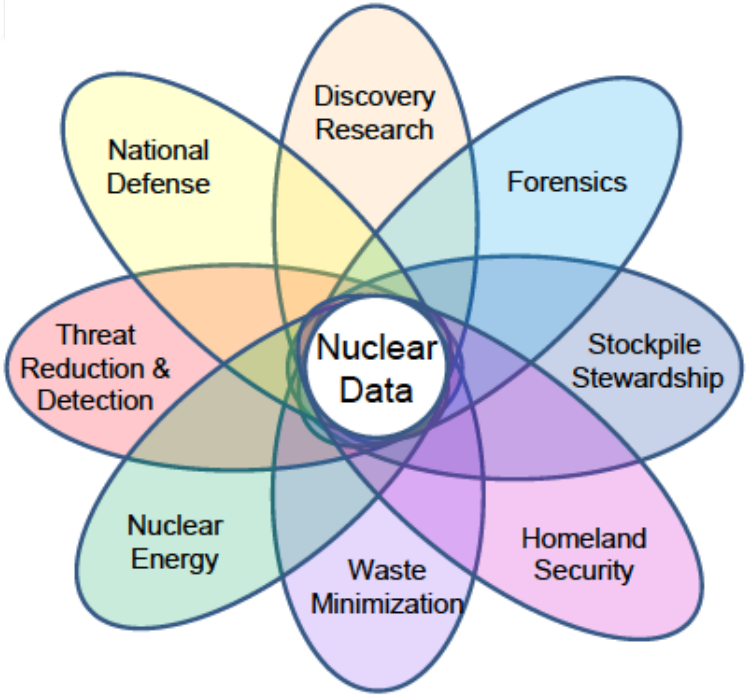
New USNDP Mission Statement: *…. The USNDP also addresses gaps in the data, through targeted experimental studies and the use of theoretical models.*

Nuclear Data Working Group (C. Romano – ORNL) DOE-NP, DOE-NE, NNSA, DTRA, DNDO (11/2015, 12/2015, 2/2016, 3/2016)

NSSC Renewal w/new Nuclear Data Crosscutting Area (10/2016)

NDNCA led to the Nuclear Data Working Group (NDWG) to look for ways to jointly fund high-priority nuclear data needs

U.S. DEPARTMENT OF ENERGY | Office of Science



National Nuclear Security Administration

ENERGY.GOV Office of Nuclear Energy

DNDO Domestic Nuclear Detection Office

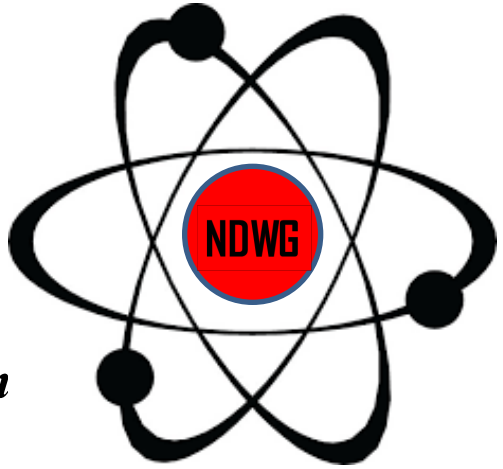
Dr. Timothy Hallman, Associate Director of the Office of Science for Nuclear Physics
April 5, 2015

Presentations were made in Washington on April 14, 2016

The Nuclear Data Working Group under the leadership of Cathy Romano (ORNL) developed a multi-agency 5-year proposal to address cross-cutting nuclear data needs

Proposals presented to Program Managers from DOE (7 offices), DTRA and DHS - Washington DC (4/14/16)

1. ***Revitalizing the Nuclear Data Pipeline***
2. ***Expanding Covariance Data and its use***
3. ***Improved Scattering Data for Neutron Transport***
4. Upgrading Capture Gamma-ray Data in ENDF
5. ***Improvised Theory, Modeling and Evaluation of Fission Fragment Yields***
6. Nuclear Fission Experiments
7. Reestablishment of Actinide Target Production Capabilities



DOE-NP is leading a new Interagency Group of Program Managers charged with determining how to address these needs

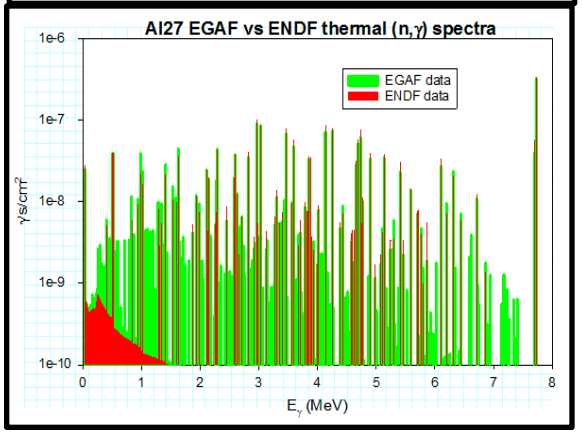
The non-USNDP NDWG Proposals

The NDWG met three times to develop a joint plan and "down select" to a list of the "most important" topics

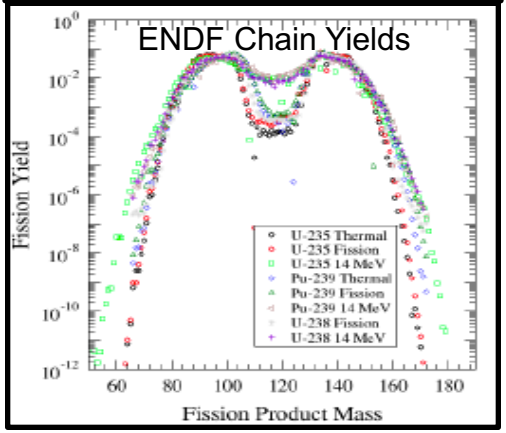
All experimental proposals included an evaluation component

7 topics made the cut and the USNDP is involved in 4 or them

Capture Gamma Data (Brad Sleaford)



Fission Experiment (Todd Bredeweg)



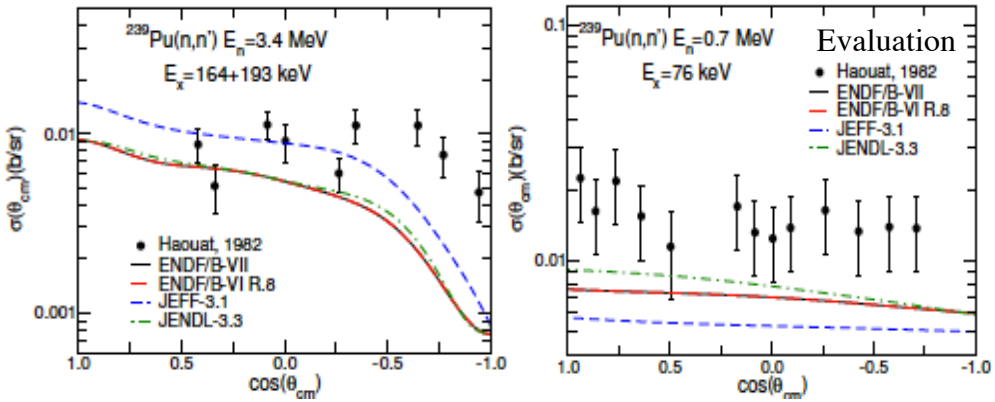
Actinide Targetry (C. Romano)

Improved Neutron Transport : Conversion Electron and Neutron Spectroscopy for Understanding Scattering (CENSUS)

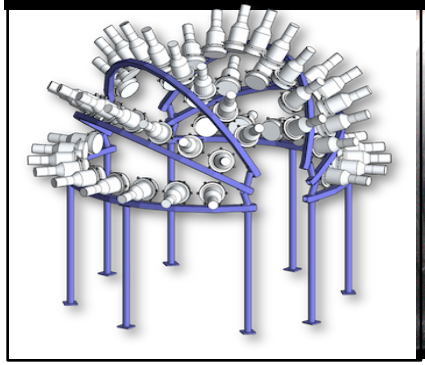
Summary of Tasks

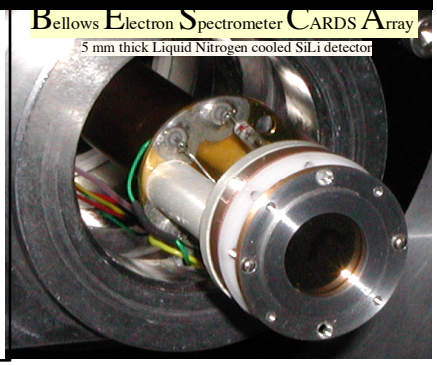
- Task 1: Measure outgoing neutron energies using the Chi-nu spectrometer with new detectors developed at RPI
- Task 2: Develop a conversion electron spectrometer (CENS) to definitively identify scattered neutrons over fission neutrons
- Task 3: Mount an experimental using Chi-nu + CENS to campaign at neutron facilities with complementary capabilities throughout the world
- Task 4: An evaluation campaign where embedded evaluators train students as they produce improved (n,n) cross sections

(n,n') on the "Big 3" actinides are very poorly known*



CENS/BESCA (ORNL) + Chi-nu (LANL)





*NDS 108 (2007) 2589–2654
Nucl. Sci. Eng.: 81, 491-511 (1982)

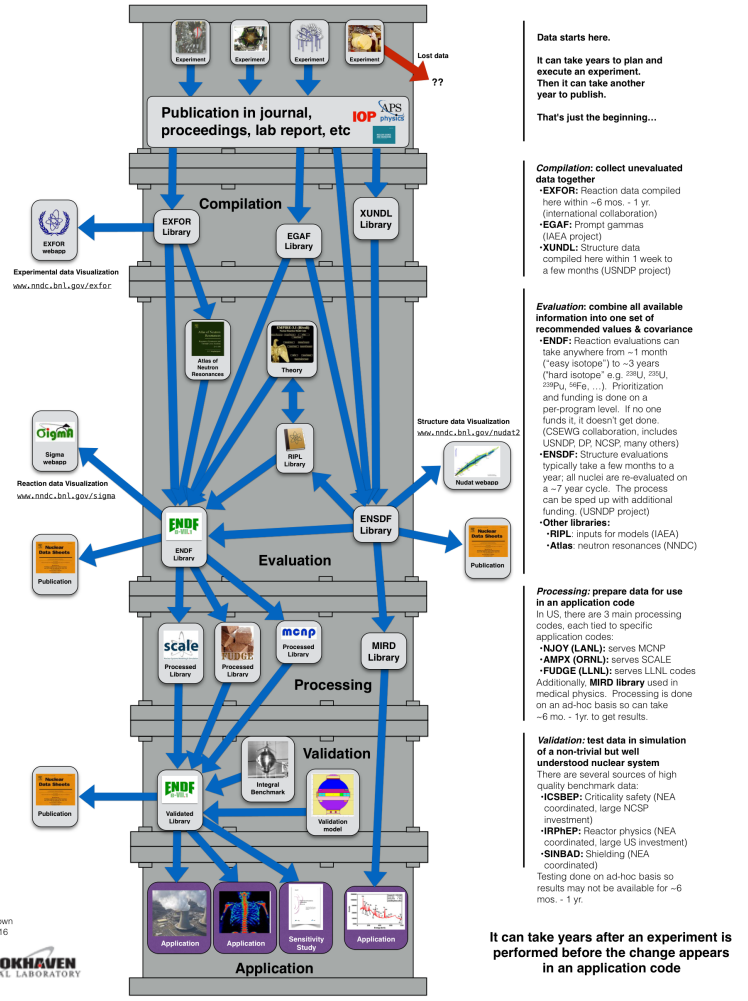
And now for Dave…

Revitalizing the Nuclear Data Pipeline

Summary of Tasks

- Task 1: Nuclear structure data infrastructure modernization
  Innovation is hobbled by a legacy punchcard format
- Task 2: Nuclear data table quality assurance Eliminate a major bottleneck to getting data to users through benchmark automation
- Task 3: Processing code quality assurance Processing codes feed applications, QA essential
- Task 4: Data visualization and web modernization Visualize reaction and structure data on both open and closed computer systems

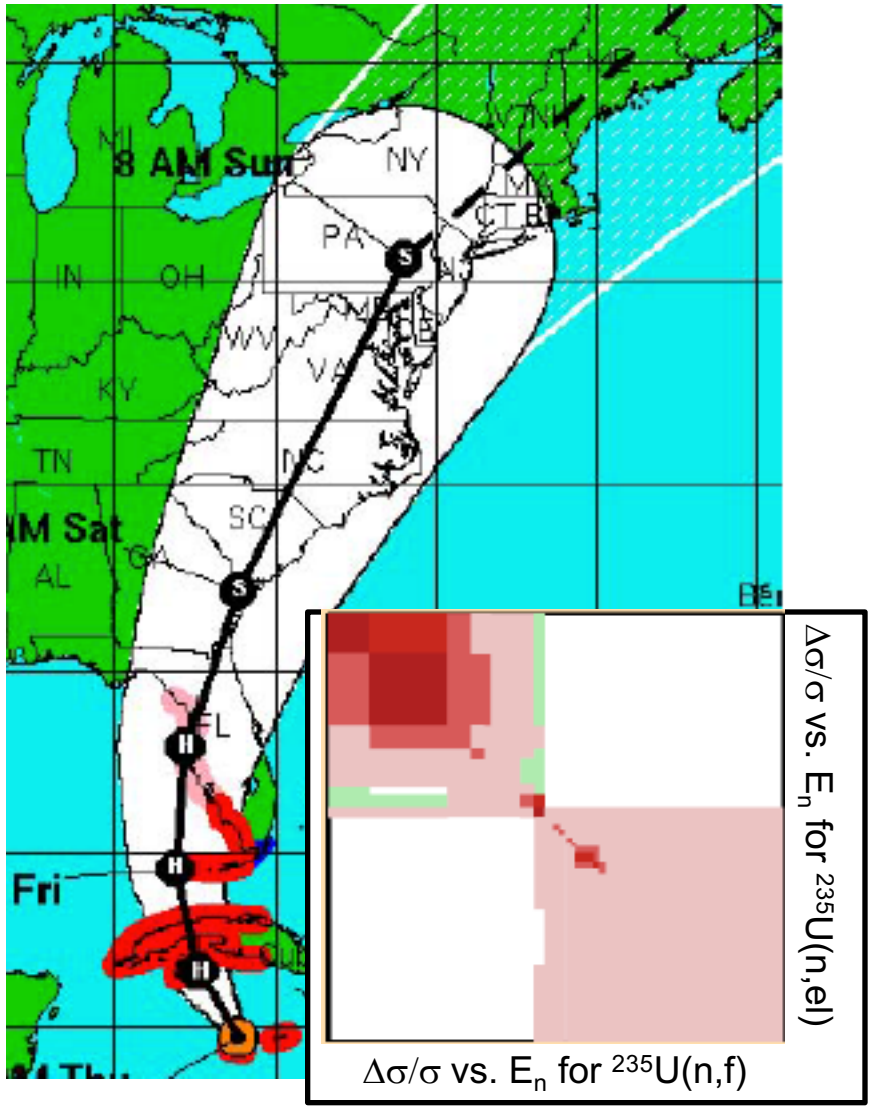
The Nuclear Data Pipeline



Expanding Covariance Data and its use

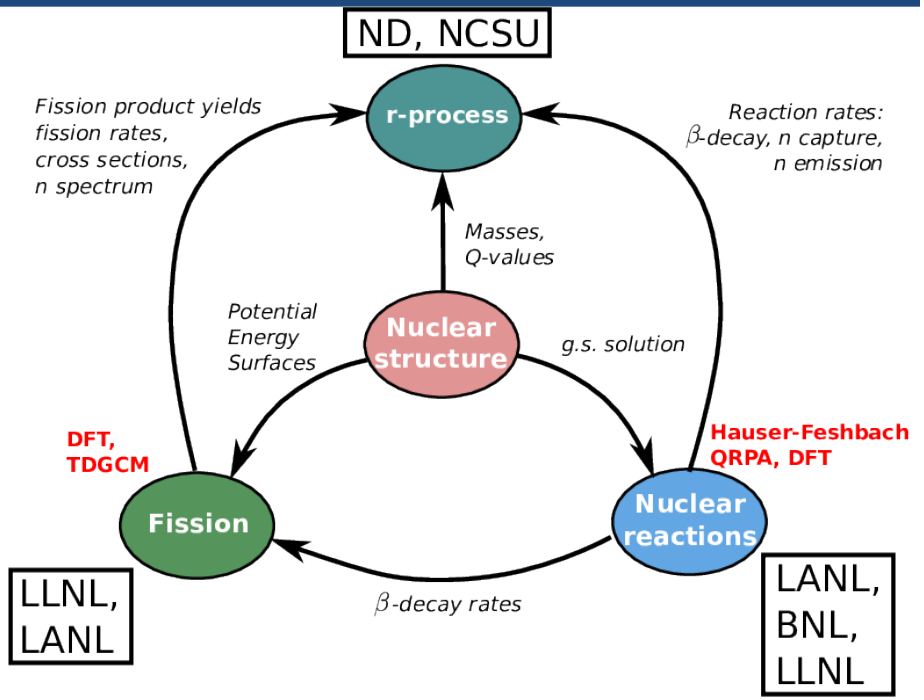
Summary of Tasks

- **Task 1: Expand the ENDF Format:** Allow more complete covariance information to be included in evaluated nuclear data files.
- **Task 2: Expand ENDF Checking Codes:** Allow for verification of these covariance data.
- **Task 3: Expand ENDF Processing Codes:** Permit translation of these covariance data from general purpose evaluated data file(s) to end-user defined application specific files.
- **Task 4: Expand Application Code** Capabilities: Allow for more sophisticated and comprehensive end-user simulations of problems of programmatic interest.
- **Task 5: Expand End-User Training:** Provide end-users with the knowledge how to properly interpret the application code results



Newly Funded Activity: FIRE—Fission In R-process Elements

- Incorporate state-of-the-art fission models developed at NNSA laboratories into simulations of the r-process
  - Participants: LLNL (lead), LANL, BNL + Notre Dame, North Carolina State University
  - Jointly support by DOE/NP and NNSA/NA221



- Calculated r-process abundances depend crucially on masses, separation energies, decay rates (β-decay, γ-emission, fission), capture rates, etc.

- Fission has a major impact on the r-process
  - Fission properties are by far the most uncertain data for r-process simulations
  - NNSA laboratories have developed advanced capabilities to describe fission
  - Fission may be the key to pinpointing the location of the r-process

Summary and Path Forward

- Following the 4/14 meeting the program managers formed an *Interagency* NDWG (*Comments Ted?*)
- The is already an increased focus on nuclear data
  - NA-22 support for Nuclear Data Activities (Talou venture renewed, FIRE, Nuclear Data Area in the NSSC…)
  - FOAs featuring nuclear data - FY17 DTRA-BAA, FY17 DNDO-ARI included the NDNCA whitepaper Appendix A, FY18 DNDO lab call included NDWG targetry support…
  - FY18 NA-22 lab call: *Nuclear Data for Nonproliferation Applications*: *As a cross-cutting, enabling capability that underpins nearly all aspects of nonproliferation science, there is desire for significant improvements in nuclear data, theory, and library tools relevant to the nonproliferation mission. The emphasis of nuclear data measurements or theory must be explicitly applied to solving current or future needs for the nonproliferation mission.*